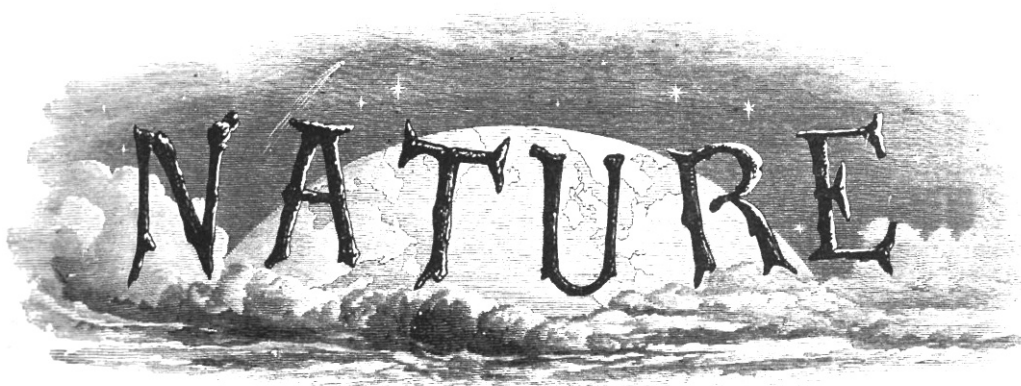




A WEEKLY ILLUSTRATED JOURNAL OF SCIENCE.

*"To the solid ground
Of Nature trusts the mind which builds for aye."*—WORDSWORTH.

THURSDAY, MAY 4, 1893.

AN AMERICAN TEXT-BOOK OF PHYSICS.

Physics, Advanced Course. By George F. Barker, Professor of Physics in the University of Pennsylvania. Pp. 902. (London: Macmillan and Co., 1892.)

THE days are nearly over when a text-book of Physics in one volume is any longer a possibility. The attempt to compress so great a mass of knowledge into small compass seems necessarily to involve the omission of anything like the full elementary explanation required by junior students, as well as the more advanced discussion suitable to seniors; it also appears necessary to curtail any approach to a mathematical investigation, and to dispense with the details of experimental appliances.

With so much omitted it may surprise those who do not know what a vast region is now cultivated under the name Physics, that there is enough left to fill a bulky volume. But there is, and this volume contains it, viz. the quiet and systematic rehearsal of the broad facts of the subject, a statement free from rhetoric and from effort, a statement which flows placidly on in a peaceful and easy flow.

The absence of friction renders the book hardly suitable for a beginner, especially one without a teacher; he could hardly manage to grip the facts as they passed him. But after a serious course of lectures, after a disjointed struggle with difficulties in this or that department, it would be a pleasant relief to a student to have a book like this put into his hands as a kind of glorified note-book, that he may leisurely revise the whole in a corrected and simple form. If a third year student is able to read this book feeling that it continually excites in him recollections of the more detailed treatment he has elsewhere acquired, he may be satisfied that he knows a good deal of Physics; if, on the other hand, he comes across pages where the matter is new and where he has any difficulty in apprehending what is said, he may feel assured that here there is something desirable for him to attend to and learn from any of the more detailed and elaborate sources open to him.

That is how the book strikes me: as one eminently suited to assist a student's revision of the subject, so as to ensure that his knowledge may be free from glaring gaps; but not as a book that could be recommended for learning from. It would probably, as I have said, be difficult to learn from, but a still more fatal objection to its use by a solitary learner is the probability that its easy flow would convey an altogether erroneous impression of the difficulties that really bristle about the subject, and would lead to only a very superficial smattering, quite incommensurate with the vast amount of information which is summarised and made more or less palatable by this genial treatise.

Having thus indicated what seems to me the general usefulness of the book I proceed to indicate its contents. It begins with fundamental units and the laws of mechanics, together with a summary of the properties of matter. Then it proceeds to treat of Energy as belonging to various bodies; masses, molecules, and the ether. This is the classification definitely adopted throughout the book—it is a treatise on the forms of energy. "Mass physics, molecule physics, and æther-physics; and the fact is significant that to the last division of the subject it has been found necessary to devote more than half of the entire work." "Radiation is considered broadly, without any special reference to those wave-frequencies which excite vision and are ordinarily called light." Modern references abound, and the subjects dwelt on are those which at the present time are most exciting attention. "The author's aim has been to avoid making the book simply an encyclopædic collection of facts on the one hand, or too purely an abstract and theoretical discussion of physical theories on the other." "He has made free use of all the sources of information at his command. The names of those physicists to whom the science is most deeply indebted are given in connection with the subjects on which they have worked, and in order to bring the student into more intimate contact with these great minds, the laws or principles they have formulated have frequently been given in their own words."

This free quotation is characteristic of the book, and sometimes it could be wished that a chapter and verse reference for further following up had been given, instead of only the mere name. But, after all, such reference

would have been fidgeting and out of harmony with the even tenor of the text, which is about as different as it can possibly be from the productions of German authors.

I do not myself think it a good plan to incorporate formulæ in the text, so that there is nothing for the eye to catch. Such a proceeding may be convenient to the printer, but it is only permissible when the expressions are very simple and easy ones. However, all those in this book are simple and easy ones, so possibly no student need feel any inconvenience.

So far as I have observed, the statements made are usually clear and correct. There are some few exceptions; for instance, the definition of self-induction on pp. 814, 815 is not satisfactory. On p. 858 the distance apart of points, between which unit difference of magnetic potential exists, is unnecessarily specified in the definition of Verdet's constant; but this is a slip made also in Everett's "Units," and is an easy one both to make and to correct.

The account of a volume-air-thermometer given on p. 295 can hardly pass muster; and indeed this and other meagre references to the work of Regnault may be taken as typical of the absence of even the outlines of those experimental details which one is accustomed to find in the writings of French authors.

But, as I said at the beginning, the attempt to compress all physics into one volume of reasonable size and good print can only be made if one is content to omit about 90 per cent. of what might be included. As a convenient summary of a course of lectures of a particular grade the book is probably about as good as can be expected, and it may be found useful for revision-work by students in this country.

OLIVER LODGE.

BABYLONIAN COSMOLOGY.

Die Kosmologie der Babylonier. Studien und Materialien von P. Jensen. (Strassburg.)

THE thick volume of five hundred and fifty pages of closely printed matter lying before us represents what was originally intended by its author to be the first part of an exhaustive treatise upon the mythology of the Babylonians in the widest sense of the term, but he was obliged to abandon the scheme after investigating the spiritual and religious views of the Babylonians which the cuneiform texts make known to us, because he was driven by facts to admit that any such attempt would, with our present information, be premature. Prof. Jensen has then contented himself with placing in the hands of his readers a series of facts and a collection of materials for making researches into the astronomical system of the Babylonians, together with the results which he deduces from them. He is fain to admit that the present state of the study of this subject is lamentable in the extreme; for those who have worked at it in times past, and even those who still profess themselves to be devoted to the science, link idea to idea without regard to natural sequence, and draw conclusions, and invent systems, and give themselves over to traditions rather than to the serious discussion of the facts and statements of the cuneiform texts. Other writers being naturally

incapable of distinguishing what is certain from that which is not, and possessing neither the knowledge necessary to control the work of Assyriologists, nor the power to work independently, reproduce the statements given doubtfully by scholars, and send them among non-experts as incontrovertible facts, and thus it comes that the greater part of the work which is current under the name of "Babylonian Mythology" must be considered base coin only.

The earliest worker in the field of Babylonian Astronomy was the famous Dr. Hincks, who published the result of his investigations of some cuneiform texts in the British Museum in the Transactions of the Irish Academy in 1856. In 1862 Sir Henry Rawlinson, the "Father of Assyriology," discovered that most important document now universally known as the "Eponym Canon," in which an eclipse of the sun was mentioned. As Dr. Hincks overlooked the fact that the greater number of the texts which he regarded as astronomical were purely astrological, this discovery by Sir Henry Rawlinson of the notice of an astronomical event recorded by the Babylonians, the accuracy of which could be demonstrated by modern mathematical calculations, must be considered as the first step towards a scientific elucidation of Babylonian astronomy, and a proof that pure astronomical science already existed in the Euphrates Valley as early as B.C. 700. In 1871 the veteran Assyriologist, Jules Oppert, published in the *Journal Asiatique* the results of his study of some syllabaries, and other texts in which the Babylonian names of the planets and other stars were given, and three years later Prof. Sayce published a lengthy paper entitled "The Astronomy and the Astrology of the Babylonians," in the Transactions of the Society of Biblical Archaeology, in which he reprinted, without making a new collation, most of the astrological texts published by Rawlinson in "Cuneiform Inscriptions of Western Asia," vol. iii., to which he added English translations. On the work of these two last-mentioned Assyriologists Prof. Jensen makes some strong comments.

Passing over smaller works by Schrader and Lotz we next strike firm ground in the excellent work by Drs. Epping and Strassmaier. The former is an astronomer of no mean skill and ability, and the latter is one of the greatest experts in modern cuneiform decipherment and is thoroughly skilled in working at the tablets at first hand. In the work entitled "Astronomisches aus Babylon," Freiburg i. B. 1889, these scholars published the texts from three tablets of lunar ephemerides for the years 188, 189, and 201 of the era of Seleucus, which began B.C. 312, together with a long astronomical commentary upon them and remarks upon Babylonian ephemerides of planets in general. From these texts it was evident that the Babylonians were accustomed to tabulate the heliacal rising and setting of the planets and of Sirius, and the opposition of the planets to the sun, and it was discovered that they had in the ecliptic a number of groups of stars, twelve of which correspond roughly in nomenclature and in position with the signs of the Zodiac. When this important publication appeared Prof. Jensen had for some years been independently working at the history of the origin of the Zodiac, and a large portion of his work now before us was already in type. A careful study of the